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13. ABSTRACT *(Maximum 200 words)*
Work by Prof. Wornell and his collaborators is summarized here

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Interim Progress Report for
ONR Grant No. N0014-95-1-0834

Advanced Signal Processing Techniques for Wireless Communications

for the period

June 1, 1995 through October 31, 1995

Principal Investigator: Prof. Gregory W. Wornell

Research Laboratory of Electronics
Massachusetts Institute of Technology
Cambridge, MA 02139-4307

Early this summer an outstanding graduate student in the department was recruited to participate in the project, and work on the proposed research is well underway. As we are in the start-up phase of the research, expenditures against the grant are only now beginning to accumulate. The substantial initial summer effort of the Principal Investigator on the project was funded entirely through a career development chair appointment, while the initial summer effort of the graduate student was funded through a fellowship. The student is now being (and will continue to be) fully supported by this grant.

There are several components to the extensive research underway. In one component, we are developing new and extremely promising bandwidth-efficient temporal diversity strategies for single- and multi-user wireless communication in time-selective multipath fading environments. Both frequency selective and frequency nonselective channels are begin considered. Another component of the research in progress is exploring the use of nonlinear dynamics and chaos in the design of error-correcting codes for communications applications. Finally, we are exploring the potential (and limitations) of advanced blind equalization techniques in current and next-generation communication systems.

Already, we have had a number of exciting preliminary results from the project. These are described in detail in the following publications.

1. G. W. Wornell, "Spread-Signature CDMA: Efficient Multiuser Communication in the Presence of Fading," *IEEE Trans. Inform. Theory,* vol. 41, no. 5, pp. 1418–1438, Sept. 1995.

2. S. H. Isabelle and G. W. Wornell, "Statistical Analysis and Spectral Estimation Techniques for One-Dimensional Chaotic Signals," submitted to *IEEE Trans. Signal Processing,* Aug. 1995.

3. O. Shalvi and G. W. Wornell, "Sufficient Conditions for Blind Equalization with Trellis Coding," submitted to *IEEE Trans. Inform. Theory,* July 1995.

4. G. W. Wornell, "Efficient Multiuser Communication in the Presence of Fading," in *Proc. IEEE Int. Sympo. Inform. Theory,* (Whistler, Canada), Sept. 1995. (long presentation)

5. B. Chen and G. W. Wornell, "Efficient Channel Coding for Analog Sources using Chaotic Systems" submitted Aug. 1995 to *Proc. Int. Conf. Communications,* (Dallas).

Summary of Expenditures since June 1, 1995

Category	As of 9/30/95	As of 10/30/95
Personnel	3,427	10,991
Employee Benefits	1,525	4,891
Other direct costs	99	797
Indirect costs	2,004	7,932
Total	7,455	24,611

GRANT NO: N00014-95-1-0834

ATTACHMENT NUMBER 1

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